

REMARKS

ON A

PAMPHLET,

INTITLED,

Of an Artificial Sulphureous Water resembling
the Natural: A Thing hitherto supposed
impracticable in CHEMISTRY.

By the AUTHOR of the MANUFACTURE of DRUGS.

In which are interspersed

Some Sketches of the HISTORY, ANALYSIS, PRO-
PERTIES, QUALITIES and MEDICINAL USES of

SODA or KELP.

By which the false Positions, mistaken Notions, and
baseless Arguments of the AUTHOR are exposed
in a fair Light.

IN A

SECOND LETTER

To the Learned and Ingenious Doctor RUTTY.

By C. LUCAS, M. D.

Non fingendum aut excogitandum, sed inveniendum.—
VERULAM.

D U B L I N :

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REMARKS

ON A

PAMPHLET, &c.

S I R,

AFTER having lately addressed you in a public manner, you will probably be surprised at another application of this kind, so soon after the first.

But, your wonder will cease, when you find that he who put the *HERCULES's Club into your hand, to knock me down*, has since my last to you, thought fit to put that *massive Club* into every body's hand, probably hoping some one, as *lucky* as himself in the *discovery*, may apply it to the intended purpose, more effectually than you have yet done. However, as this seems an appendage to your argument, it is fit to address the confutation of it also to you.

It is not altogether for want of regard to the author of this pamphlet, that I do not immediately address myself to him: I have known him long and well. Looked upon him as one of the best Apothecaries and Botanists among us, and till now, believed him to have had a competent understanding in Chemistry. From
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these sentiments, I never omitted an opportunity, public or private, of doing justice to his merit. But, as he has lately thought fit to enlist himself in *your Bands*, so as *secretly* to put an *offensive Weapon* into your hands *against me*; and, not content with that, puts it now into every body's hands, fearing your cause not strong enough without a publication; and as it will appear, that by this, he has acquitted himself of that knowledge in Chemistry, which I was willing to allow him before; I choose to address this to you, as the open *Champion* of the cause, for which all the *Moles* work under ground. But for this, I have another motive, I have as just cause to suspect you, Sir, the Author, Compiler, or Editor of this Pamphlet, as I have to judge, that the reputed Author of this is seen in the diction, stile, manner and matter of many parts of your last pamphlet.

From your ARGUMENT of *Sulphur or no Sulphur in Waters*, p. 10. &c, we are given to understand, that our Author *had discovered a solution of Sulphur, which, far from Yellow, is Colorless*. And this both he and you every where assert to *resemble, to bear great analogy to, or to be actually one and the same with, the Natural Sulphureous Waters*. How just these notions are, I shall endeavour to explain in the sequel.

Our Author sets out very pompously on his Title Page, with telling us, that *his Artificial Sulphureous Water is*, as he elegantly expresses it, *a Thing hitherto supposed impracticable in Chemistry*; and p. 3. says, "to make a sulphureous water in Chemistry to agree with the natural, in appearance, that is, to have no Color, but to look like common Water, and to produce also the same Phænomena, upon a Chemical Analysis, is allowed never yet to have been done, and therefore generally thought impracticable" and this, he gives us but as a preamble to the grand, the *arduous Undertaking, the Discovery*, or as may be said in his own Words else where, the *Hercules's Club, &c.*

Being

Being persuaded that his discovery of an Artificial Sulphureous Water bears the most perfect analogy to the Natural Sulphureous Waters of *Aix-la-chapelle*, *Lucan*, *Swadlingbar*, &c. he exults highly, p. 4. upon introducing into practice a water equally efficacious in the like medicinal virtues, which the *poor* and the *hospitals* may purchase, consistent with their *penu-ry* or commendable *oeconomy*, and *preferable to the Natural Waters*, which must lose their virtues before they could be consumed.

He goes on and tells us, that all the Inconveniences of the uses of the natural are obviated by those of *his Discovery* of the Artificial Sulphureous Waters. And thus presuming, that this his Artificial Sulphureous Water *answers all, or a great Part of the ends* of the Natural, he declares *it must be allowed* a most useful *Discovery*; and therefore, *to serve the Public*, or according to your prophecy, *Argum.* p. 10. *finding the proper season for divulging the great Secret come*, or which is still more likely, according to the author's own words, p. 9. *bearing that I was making Experiments on the Sal Sodae*, by which his discovery may be anticipated, he chooses to give the crude and indigested Tract thus prematurely to the public, being perfectly well assured of the Utility of a Discovery, which, with becoming modesty, he totally arrogates to himself.

Now let us see how far the Public in general, and Doctor *Rutty* in particular, are obliged to this ingenious Apothecary, and how thankful I am to be to his Judgment and Candor, on finding that this *Knotty Club*, which I am not to look upon as his friendly, *his pretious Balms*, has not yet, as he intended, *knocked me down, or broke my head!*

He says, he heard, that I was making experiments on *Soda*, and fearing, no doubt, that I should hit upon the Discovery, which he says, p. 8, 9. I had come *very near*, in my *ESSAY on Waters*, p. III.

p. 105. §. 334 to 338. he judges it best to give it a premature publication.

And premature, indeed, it must for ever be till explained by a man somewhat better instructed in the rules and principles of Chemistry, than this your most learned Coadjutor appears to be.

As all great discoveries are ushered into the world with their history, so our Author tells us, p. 5. how he light upon this great and most important of all discoveries; a discovery, which while it prostrates *Lucas*, at the first stroke, under Doctor *Rutty's* triumphant feet, sets the Discoverer above, not only the contending parties, but the rest of the Profession, not only in his particular *ministerial* branch, but even in the others, not excepting the *Judicial*.

But as lucky accidents, not designed researches, have given birth to the greatest discoveries; so a *Soldier* taught the world the PRINTING ART, a *Priest* the destructive Invention of *Gun-powder*, and an *Apothecary* taught the admiring world the art of making a *Colorless Solution of Sulphur*, equal to the Natural Sulphureous Waters, even of *Aix-la-Chapelle*!

It is a pity the Author had not some friend near him when he wrote, to put him in mind of a rule, from which no good chemical or philosophical writers can ever recede; I mean that of describing or naming, with the strictest precision, the subjects of which they treat. Now, whether you be a pupil of our Author, or he of yours, in trampling this necessary rule under foot, or whether You write for him, or he, for You, I shall not take upon me to say, more than I can determine whether you have not both the same view in being vague and indeterminate, as you in particular, are with respect to *Sulphur*, the *Phlogiston*, the *Oily Matter*, &c. and he in laying down the subject of his present pamphlet.

Our

Our Author says, he hit upon *his discovery* by being employed in making what he is pleased to call *Sal Rupellense* or *Sal Seignette*, by which I understand he means the Salt discovered by M. *Seignette*, an ingenious, but modest, Apothecary of *Rochelle*, composed of the Mineral Alkali and the Acid or Chrystals of Tartar.

For this purpose, our Author, p. 5. tells us, he took a strong Solution of *Sal Sodae*; and judiciously, indeed, he had taken the pure Alkaline Salt of, rather than the medley of Salts and Earths contained in, *Kelp*, for the purposes of the *Sel de Seignette*; but by his leave, this could not so well answer his Sulphureous Impregnation. Therefore, wherever our Author mentions *Sal Sodae*, we shall find, he lies under the grossest mistake, not fully knowing what the gross *Soda* is, and much less the *Sal Sodae*, or pure generic Salt of *Kelp*.

But, before he lays open his *important Secret*, he seems very solicitous to acquit himself of *any polemic disposition*, and here, as well as on p. 7, 8, and elsewhere, seems to express an equal regard for you and me, and on p. 22, recommends alike the perusal of your Synopsis and mine Essay on Waters.

In these however, his practice contradicts his Expressions: If he were *void of all polemic dispositions*, and thought he had discovered some errors of mine, why not give me an opportunity of retracting or correcting, rather than furnish you with means of cavilling at, them? Why give you a specimen of his Sulphureous Water, as an *Hercules's Club*, to knock down your *Antagonist*, as he termed it to you, when I publicly invited him and all men to correct me? *

* ESSAY ON WATERS, preface, p. xxviii. If any be humane and public spirited enough to wish this work correct and complete, their correction and amendments shall be most gratefully received and publicly acknowledged, if the book lives to undergo another edition.

And why can he seem to pay an equal regard to you and me, or to our writings, when, if he knows any thing of us, or them, he must know, nothing so opposite, as your notions and mine in Chemistry and the practice of Physic, particularly with respect to Mineral Waters ?

But, there is nothing new to me in finding Apothecaries, who outwardly bear a smooth countenance towards me, conspire in private against me. My Crime, indeed, You know is obvious : When I was in that profession, I exposed it's frauds, and shewing the necessity of a reformation, I got an act of parlement passed to reform it, though the author and all the rest of the fraternity opposed it. It is needless to say, I then suffered the usual fate of reformers. But, that act, which in my long absence was suffered to expire, I got revived and amended the last session of parlement, the author and most of the other apothecaries in town giving all private and public opposition in both houses of parlement.

Will these men ever forgive me ? You, who are more in their secrets, know they cannot. Will they moreover forgive my going to their shops and detecting their fraudulent dispensations of my prescriptions, and other foul practices ? You know they cannot. No wonder then, so many of them, who pretend to befriend me, take so many secret means to wound my character. But, of these Intentions, I must however, acquit our Author ; having never had greater satisfaction in the dispensation of my prescriptions, than in his Shop ; and as I know him to be a gentleman, by Birth and Erudition, think *this discovery of his secret* to You, and the premature publication of it, the onely proofs of the want of Candor and Judgement that may be justly layed to his charge. This sometimes induced me to attempt to vindicate him from the scandalous charge of being the author or even the foster-father of a spurious progeny, which
from

from the family resemblance, I should think justly layed at Doctor RUTTY's door.

But, he lays some stress on having shewn me some of this sulphureous water ; but confesses he no more told me the secret, than you. I well remember, I looked at it and told him, what will soon appear, that there are various ways of making such an impregnation.

Our Author at length, enriches the longing world with the great Discovery, and gives us no less, I think, than ten or eleven experiments touching this subject, and I am sorry to say, that whenever he speaks relative to *Sal Sodae*, which is the Salt of *Kelp*, the Negative may be generally put upon each.

For example, in **EXPER. I.** he directs four drachms of the purest *Sal Sodae* or Salt of *Kelp*, to be boiled in twenty ounces, to a pint of water. This is what gives a water, or as he calls it, a *Decoction, without color*, of an *offensive strong Smell*, like the *natural sulphurous waters*.

Now, on this, most of the other experiments relative to *Kelp*, depend. And I will venture to say, Our Author never made one of his experiments in this manner, and therefore, for want of accuracy and precision, first sets himself wrong, and then his ignorant or unwary readers, but particularly the secret *Junto*, in the number of which, You will forgive me if I give You the first rank. Let us come to the proof ;

Soda or *Kelp* is made indiscriminately from the *Algae marinae*, or *Fuci marini*, being partly succulent, and partly tough and hard plants, of different forms and denominations. They are generally demipelucid, and of a leather-like color and consistency, growing on stones, shells, and other hard bodies, under, or within reach of the sea, the more old, woody or hard kinds being never free from little shells and other animal productions.

It

It is made by the rustics on the Sea shores, where-
 ever these weeds called, Sea-Weeds, or *Sea-Wrecks*,
 are found, by making pits, lined and surrounded with
 stones, in the earth, lighting some fuel therein, and
 putting on first some dry, then as the furnace or pit
 heats, some green or fresh weeds or wreck, till the pit
 is filled with the calcined plants; then the calcined
 mass is raked with iron rods, that by exposing the
 whole the oftner to the air, it may be the more
 thoroughly calcined, and consequently the more ef-
 fectually alcalised; after which, it runs into an hard
 stony mass.

This is *Soda* or *Kelp*. The Saline mass is left in
 this pit to cool, then it is broke with sledges and
 crows, and thrown by, till it is sent to market.
 And till it is applied to the destined uses, always lies
 exposed to the open air.

What does this mass contain? A slight considera-
 tion points out, and simple Analysis demonstrates.

All Marine and Submarine plants take in much
 Sea Salt in their necessary nutrition. This, in Cal-
 cination with coaly matter, is partly alcalised, and
 the native salt of the plant is in some portion and de-
 gree perfectly alcalised, by the calcination.

But the Alkali from these like bodies produced, is
 the Mineral, not the Vegetable Alkali. The later
 is very acrid and caustic, will not crystallise nor keep
 a consistent form, though ever so dry, if exposed to
 the open air, but will thence attract it's humidity and
 deliquesce into an oleaginous consistency, in which
 some portion is neutrated, by the acid in the air.
 The former is less acrid and caustic, and keeps a con-
 sistent form, being evaporated to a dryness, or redu-
 ced by crystallisation to it's peculiar crystalline form.
 This, and this onely, is the *Sal Sodae*, which will not
 answer any one of our Author's experiments, rela-
 tive to a sulphureous water, upon bare decoction;
 being the pure, simple, native or mineral Alkali.

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The rest of the mass of *kelp* is the coaly matter, necessarily arising from the imperfect calcination of a portion of the tough, tenacious sea plant.

But we are not to forget, that besides this coaly matter and the salts, there must be the ashes of the plant, and from the shells of animals, &c. growing on some of the plants, the mass of kelp, must contain the vegetable, vitrifiable earth, and lime. Besides this, it contains much iron, manifested by the color it gives glass, and by a red earth, which is found in the ley, after crystallisation of the salt of kelp, and *Seignette's* salt.

E X P E R I M E N T I.

Dissolve Kelp in warm water, it affords a colorless liquor of a disagreeable scent, especially while warm; and of a salt, bitterish and subacid, or urinous taste. Filtrate this liquor and evaporate it; a saline pellicle will appear on the surface and fall to the bottom, as it increases. When, upon protracting the evaporation, this ceases to appear, it may be separated by straining, or decanting, and will be found to be marine Salt.

E X P E R. II.

Let the remaining ley be set to rest in a cool place; and if the kelp has been long enough exposed to the air, some prismatic crystals will be found, which are *Glauber's* or *Epsom* salt.

E X P E R. III.

This salt being separated, the remaining ley, upon repeated evaporation, if necessary, and due rest, gives the peculiar crystals of *Soda*, which differ from all other saline concretions in the crystalline form.

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It appears like packets of feathers, layed one in the hollow of another. If any sea salt or *Glauber's* salt crystalise with it, they are easily distinguished by the specific forms of their crystals and other generic marks. Thus the pure *Sal Sodae* or salt of kelp, or the mineral alcali, is to be obtained; which is found to correspond in all other sensible qualities, properties and effects with the vegetable fixed Alcali; except in it's being less acrid, and in crystalising, and not deliquescing in open air. This must be our Author's purest *Sal Sodae*, though, I apprehend, it will answer none of his purposes. The remaning part of the ley, which will not crystalise, contains iron, which may, by various means, be separated from it.

E X P E R. IV.

All that is soluble being obtained by elixiviation, Exper. I. from the kelp, what remains are 1. the ashes of such parts of the plant or plants as are reduced to perfect ashes. 2. The lime, from the shells and other like animal productions. 3. Iron; and 4. a pure, coally matter, which without calcination is properly insoluble in water. These make generally about one half of the whole mass.

Hence it is evident to demonstration, that *Soda* consists of, 1. Sea salt, 2. Some portion of *Glauber's* or *Epsom's* salt, more or less, according to it's age, and the place in which it has been exposed to the air, from the mineral alcali's attracting and absorbing the universal acid, in the air; 3. *Sal Sodae*, the mineral alcali; 4. Coally matter, from parts of the plant incompletely calcined, or charred; 5. Ashes, from the perfectly calcined parts of the plants; 6. Lime, from the shells and suchlike animal productions; and 7. Iron.

From the whole compound mass then, of salts and coal, not from any of its constituent parts alone, or separately, and last of all, from the third, the mineral
alcali,

alkali, our Author's purest *Sal Sodae*, may a water be impregnated, with what our Author contends, which is, *Solutis Sulphuris principijs*, not with actual corporeal Sulphur; the one of which must be colorless, the other, colored, in some degree; unless the impregnation of the one be extremely strong, or that of the other, extremely weak.

Now, if any physician should prescribe for any patient, as I frequently do, *Soda*, would he not think himself and his patient extremely evil treated by any Apothecary, who should presume to give him *Sal Sodae*, the simple salt of kelp, instead of the compound saline, earthy and coally mass, intended and prescribed? Or, if a Physician should prescribe the pure simple *Sal Sodae*, would he not have ample cause to exclaim against the Apothecary, who should presume to give him the gross compound, *kelp*?

Yet into this palpable inaccuracy does a man run, from whom all that know him, would certainly expect better things! But, you however, Sir, must not only pardon his errors, as you must applaud a zeal which might be called blind, were it not exerted in the cause of so worthy a patron. How much does our Author deserve at your hands, who sacrifices to your service, a reputation for judgment, and candor, which have long stood, not only unimpeached, but generally applauded and approved!

Our Author's first and fourth experiments must have proved false, where he tells us, he took the purest *Sal Sodae*, had he not made a stumble in the later, which gives us to understand, that his purest *Sal Sodae* is none other than the *gross mass of kelp*, so far from pure, that it leaves half the quantity used, undissolved, after two drachms and two scruples is boiled in a quart and half a pint of water, fifteen minutes! Who would not blame any Apothecary detected in such inaccuracy? Who does not mourn

at finding the charge fall upon our famed and unblemished Author ?

But, see the consequence of making one false step ! It is generally productive of another, if it tend not to an actual fall. In p. 6, 7. he lays a great stress upon the boiling his *Sal Sodae* a certain time, in order, as he apprehends, to extract the sulphur from the sea salt : For so he is pleased in different places to explain it, *that it is the sulphur latent in the salt, or drawn to it by some hitherto unknown power ; p. 15.* And elsewhere, *it appears from the foregoing experiments, that the sulphur in the Soda, is probably not generated, but explained or laid open to the senses by the force of fire, being, as he supposes, originally latent in the sea salt ; for, adds he, had it been generated during the process in calcination, I believe it would have made the water yellow ;* and to inforce this curious reasoning, quotes two passages of HOFFMAN, very little to his purpose ; the one shewing how some portion of the oils of vegetables adhere to the salts obtained by calcination of the plants ; the other to shew that salt sometime fused, receives from the injection of powdered charcoal, *phlogiston* enough to give the mass as much the appearance of Sulphur, as if actual brimstone had been mixed with it ; observations which should have opened our Author's eyes, had he been a little better instructed in the theory and principles of Chemistry, in which his Author is found so perfectly knowing.

Indeed our Author's own Experiments N^o. VII, VIII, IX, X. must have opened his eyes, however ignorant he shews himself in the rules and principles of the Art, had he not been so premature, so precipitate in his publication, as to leave himself no time to think of any thing, but the saving his friend Doctor Rutty from his antagonist's indignation. What pity it is, he has not succeeded better ?

In our Author's Exp. VII. he tells us how he made kelp, from green sea-weed, which answered his purpose, that is, like his *Sal Sodae* or common kelp, gave him a sulphureous water, or decoction.

But the same trial made with the calcined residuum of the same plant, dry, Exp. VIII. as well as with that of the *Kali geniculatum*, Exp. IX. and with that of the *Kali spinosum, cochleato semine*, Exp. X. upon the like trials, gave no sulphureous impregnation.

What pity it is, our Author was in such an hurry to help his friend, that he seems totally regardless of his own reputation as a Chemist! I hope, a little cool thought and circumspection would have set him right. But since he has not taken either, for your information and his, take the hint from me: And here let me again put you in mind of your friend *W. R.*'s just axiom, *fas est & ab hoste doceri.*

The green, succulent plants in calcination, those especially that are so replete with Salt, as to suffer a kind of fusion, before they are quite calcined, must leave much coally matter behind, from which most salts of the neuter kind especially, to the nature of which the mineral alkali approaches, may imbibe phlogiston enough to yield a fetid water, answering your ideas, of the sulphureous, upon elixivation. And this surely, can be none other than a phlogistic water, like the putrid, except where a kind of generation of sulphur is produced by means of the universal acid on some neuter Salt. While on the other hand, the dry sea wreck and kalies, having been deprived of their native moisture, must have been easily reduced to ashes void of coal; and as all dry plants yield less Salt than the succulent or green, so the calcined residuum, being less salt, must be less fusible, consequently less charged with coal, less impregnated with the phlogiston, thence, and thence onely, derived.

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No wonder then, the calcined remanes of these dry plants, being but pure ashes, void of coal, with scarce salts enough to fuse them in the ordinary fire of calcination, should yield nothing more than their salts, without phlogistic appearances, or *any generation or other impregnation* of sulphur, in elixiviation, or even decoction. These gave the pure Salts, the *purest Sal Soda* of our Author, and the sea salt; and if either of these, as he asserts, contained the *latent sulphur*; it is incumbent upon our learned Author to point out some other reason, why these his *curious experiments* answered not his *sulphureous purposes*.

But our Author would not have us think, his *artificial sulphureous water* impregnated by a *generation* of sulphur; for this, he says, *he has no doubt, would color the decoction*, yellow; and that for a curious piece of reasoning, which is so like yours, that I beg leave to suspect, he borrowed it from his most worthy patron. Take it in his own words; he says, *it would make a yellow decoction, as not being the latent essential sulphur of sea salt; but probably an acquired sulphur, I will not say, adventitious*, p. 13. This must be confessed as true and as philosophical as any *occult causes* assigned by you or any of your worthy predecessors. I need not comment further upon this curious piece of ratiocination.

Give me leave however, Sir, to observe to you here, the purposes for which you and your amanuensis introduced this *new discovery*. Was it not to contradict a position of mine, in opposition to the crude notions of you and your predecessors, *that all artificial solutions of sulphur known are colored yellow*; in order to confute your crude doctrine of sulphureous waters, which you all founded, and attempted to explane, upon this absurd plan? Did you not introduce this *secret* in your *argument*, and do you not there rely on it, as a *colorless solution* of sulphur? Now, Sir, learn a little more accuracy,

racy, precision and just reasoning, in Chemistry, which will shew you, what our Author, had he understood the etiology of his own experiments, must have seen; that to impregnate a water with the principles of sulphur, by the way of *generation*, as it is called, and the charging a water with *gross corporeal sulphur*, by any *alkaline solution*, must be extremely different. The former is a more fine and subtil kind of solution of the aggregated principles of sulphur. This must be colorless, unless the solution be highly saturated. The other, being a gross solution of the corporeal sulphur, must be colored, as we find it, unless the impregnation be extremely slight or by some means weakened after making, as mentioned in my former letter to you, p. 46.

This, our Author partly proves EXP. VI. by shewing, that an equal part of Sulphur added to his decoction of *Seda*, gives *not a colorless*, but a *yellow* sulphureous water or solution. Does not this partly point out the difference between an actual solution of corporeal sulphur, and a water impregnated with the principles of this fossil, aggregated in the method called *generation*, to wit, from the imbibition of the phlogiston by the neuter salts, or what is next to them, the mineral alkali, the fusion or solution and union of the former of which is facilitated and expedited by any fixed alkali?

I suppose, however, our Author thinks me much obliged to him for the apology, he is pleased to make for the seeming absurdity of a position, he is pleased to put into my mouth; to wit, *that all artificial sulphur waters are yellow*, when he should have known, that my general position is, what he proves undesignedly, *that all the known artificial solutions of sulphur*, or actual corporeal brimstone, are more or less *yellow*. This neither he nor you are able to contradict, with any color of truth and reason. So that his apology is as nugatory, not to say impertinent,

tinent, as his reasoning is in general absurd and ridiculous. He says, p. 9, 10. that *his discovery* does not impeach my general assertion, which he does not dare to recite, but forwardly, as unfairly makes the above one for me. Then, he begs the *reader will please to observe, that he did not invent, he only discovered, the colorless solution.* See the nice distinction between *invention* and *discovery* ! I never took you for a *Jesuit*, or I should have thought this subtil sophistical distinction borrowed from you. He goes on, p. 10. *I added not the sulphur to the first process of the colorless water, my art only discovered it latent in the materials, to wit, the Sea Salt, and explained it to the senses ; as I put it not there, it is nature's work, for when sulphur was added, by me, to the process, it turned it yellow ; that was art, &c.* Let this small specimen of our Author's inexhaustible fund of farcical humor divert you and your club, it shall pass without further animadversion from me. I shall only beg leave to recommend it to your friend the Author, that when he chooses to exercise his witty talents upon any writing, he takes care, first to understand, and then to cite it fairly. All which I suppose our ingenious Author would have done, were it not in complaisance to you, his excellent patron ; and in just deference to your great example, let me just add, that this proves, rather than contradicts my general position, *that all the known artificial solutions of sulphur are more or less yellow.*

But, our Author is not more remarkable for being the first who *extracted sulphur* from *pure sal sodae* and from *sea salt*, which he seems to have found to be as it were the *Matrix* of Sulphur, than for his discovery of the affinity or attraction, or as he is pleased to express it, the *tendency* of sea salt, or the acid of sea salt *to be near sulphur.* And of this, he is as happy in his proof, and reasoning, as usual. He reserves his *Exp. XI.* for this proof, by telling us,

us, " that equal parts of *sulphur* of *antimony* and *mercurius dulcis* blended together, by a five hour's trituration, in six months, acquire, from a light brown, a dark color, and in six months more, it grows black and acquires a sensible strong acidity."

This, he is pleased to say, he told me, and by the information *surprised* and *alarmed* me. This is not wonderful, as I had long directed a composition of equal parts of *calomel* and *sulphur* of *antimony*, to be kept in the principal shops with which I had intercourse in *London* and *Dublin*; finding it by experience, what theory pointed it out, a most safe and powerful alterative, without having ever seen an evil effect from it, under my prescription.

When a person of our Author's reputed accuracy and judgment in Chemistry, mentioned this as an actual observation of his, I could not help being surprised and alarmed, and to be further satisfied, went to the shop of the Apothecary who had been by me longest directed to prepare it. He shewed me some that had been many months mixed, without suffering any of our Author's observed changes. So I concluded, what I have since been convinced, that this difference might have arose between the using well prepared *calomel* and bad, or *mercurius dulcis*, in the composition; as in one the acid of salt is more broken and blunted than in the other. Upon this, the *surprize* ceased and the *alarm* vanished.

But, our Author now confirms my conjecture, as he renews my surprise, when he produces this observation of his, as a fit proof his new invented attraction between sulphur and the acid of salt, in which curious piece of reasoning, it must be confessed, he succeeds as well as usual, and is as much as he can wish, an original.

On this, his *staggering* Phenomenon, he tells us, p. 14, he reasoned thus; *the acid of the sea salt,*

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which

which is part of the *mercurius dulcis*, forsakes that concrete, and points to the sulphur; when the acid of salt forsakes the *mercurius dulcis*, I suppose the mercury is rendered indolent, like simple mercury, and like that and flowers of sulphur, becomes black, like *æthiops mineral*. He adds, that he washed the acid from this black powder, but determined nothing from it with certainty.

Now, it is not very usual with me to reason upon the positions of any man, till I am experimentally convinced of the facts. But, in deference to the sentiments, I till now entertained of our Author, as a Chemist, for as a Pharmaciaian, I do not yet call his probity or judgment in question, I shall take the fact for granted, and endeavour to put him in, what seems to me, the true method of reasoning upon this his *staggering* phænomenon: *mercurius dulcis* is composed of the acid of salt, in a concentrated state, united with quicksilver, which it reduces to a sort of crystalline form, what is commonly, though falsely called the sulphur of antimony, consists, not onely of the abundant mineral sulphur of this semi-metal, which being dissolved by a fixed alkali, makes a kind of *hepar sulphuris*, or a solution of sulphur, which, as it is well qualified, dissolves a considerable portion of the *reguline* or metallic parts of the antimony.

Those being blended intimately, by continued trituration, the constituent parts of the whole mixture may be brought within the sphere of attraction of those parts of each, which have the strongest affinity to each other. Thus, the acid of salt, in some measure, breaks its union with the quicksilver, and unites with the *reguline* parts of the antimony, while the sulphur blended with these before, unites with the quicksilver or some portion of it, which hereby becomes, *not indolent*, as our Author expresses it, for that it must be in all states but inactive

or

or inert, as in the well known composition of *æthiops mineral*.

If this *Ætiology* does not satisfy our Author or you, put some of this black and acid mixture of his into a glass retort, adapt a proper recipient, give the proper degrees of heat in sand, with the necessary precautions, and, if his allegation be well founded, the result of the distillation will be *butter of antimony*, from the union of the *regulus* and the *acid of salt*, and a *black sublimate* and some *cinnabar* from the union of the mercury with the redundant *sulphur*. Here is a double decomposition, and two new compositions. Thus widely does our great Author and I differ in our reasonings upon this, as well as other phænomena! Let the judicious, let even the Author himself or you, or any of you, upon fair experiments, prove who is in the right. Compare this to the shop processes for making butter and cinnabar of antimony from crude antimony or its *regulus* and corrosive sublimate.

Let us now return to that *great and important discovery* of our Author, of an *artificial sulphur water* analogous, if not equal in virtues, to the *natural sulphureous waters*, not excepting those of *Aix-la-Chapelle*, as he asserts; in the very preparation of which, he is as erroneous as in his reasonings and his notions of the novelty of the discovery and its uses.

It has already been shewn, that it is absurd to look for a sulphureous impregnation of water from the *pure salt* of *Soda* and from *pure sea salt*; therefore such an impregnation can only be expected from some other parts of the composition of *kelp*.

It is true, the generality of *kelp* upon decoction in water yields a fetid, colorless liquor, which tinges silver yellow, and according to the strength of the impregnation, gives other proofs of containing not onely, always the phlogiston, but sometimes some portion of the other constituent part of sulphur.

But, I beg leave to contend, that these derive not their origin from either the *Salt* of the *Soda*, the mineral *Alkali*, or from the *Sea Salt*, from neither, of which, in purity, whether separately or conjointly, can Sulphur or the Phlogiston, be extracted.

This, among other circumstances, will appear from the parts of the *ESSAY* on waters, by our Author cited, p. 8, 9, &c. to shew that *I was near finding it out in my experiments on the sulphureous waters, or near hitting upon this discovery*, when I discovered the mineral *Alkali* and marine *Salt* in the *Aken* baths.

From which our learned and ingenious Author, if any thing, would infer, that these celebrated Baths are impregnated as his kelp water is asserted, to be, by a natural decoction of the *Sal Sodae*, the mineral *Alkali*, and *Sea Salt*.

Of the falsehood of this Notion, he should have been further convinced, by seeing that not onely the slightest Coction, or heating, of the *Aken* Waters, even the exposing them a short time to the air, divests them of all marks of Sulphur and Phlogiston, which surely is not the case with an impregnation obtained by coction of kelp, which he tells us, p. 5. held it's properties *after lying by* perhaps in an open vessel, for *some days*.

BUT he must clearly see, I was not at all near the imagined discovery, when he finds, that, all to the color, this artificial water is as different from the *Aken* water, as any of your alkaline solutions of sulphur can be, allowing for the difference between the mineral and the vegetable alcali, as before layed down. And if he were but candid enough to compare my Analysis of the baths of *Aken* and *Borsett*, he must have seen that each are nearly alike charged with the mineral *Alkali*, his *Sal Sodae*, and *Sea Salt*; yet the one is strongly charged with, as the other is quite void of Sulphur and Phlogiston. Was this
near

near the mark? Why, is not *Borset* Water as sulphureous as those of *Aken*, when they contain the same fixed salts in common?

To prove this analogy, and how near I was to the discovery, experimentally,

E X P E R. V.

Mix sirup of violets with *Aken* water in the natural state, it suffers no change, but dilution, for about a minute, and then begins to acquire a sea-green, gradually improving to a bright green. But,

E X P E R. VI.

Mix Sirup of Violets with this *artificial sulphureous water*, or any of the *alkaline solutions of sulphur*, and it strikes a bright green instantly.

E X P E R. VII.

Drop an alkaline ley, this *artificial sulphureous water*, or an *alkaline solution of sulphur* into *Aken* water, an earthy precipitation ensues. Whereas,

E X P E R. VIII.

Drop an alkaline ley into this *artificial sulphureous water*, made in pure water, or into any of these *alkaline solutions of sulphur*, no change, like a Precipitation, follows. On the other hand,

E X P E R. IX.

Drop any of the mineral acids into *Aken* water, and so far from any kind of precipitation, the water is rendered brighter, and it's pellucidity is preserved for days. Whereas,

E X P E R. X.

Drop any of the mineral acids into this *artificial sulphureous water*, or into any of the *alkaline solutions of sulphur*, and the one becomes *turbid and milky*, and the

the other lets a *white precipitate*, which is confessedly a *magistery of sulphur*, subside.

Add to these, that upon the slightest increase of the native heat in the *Aken* water, or letting it lye open till it loses its heat, in either case it loses it's phlogiston and all relation to a sulphureous impregnation: Whereas the artificial sulphureous water of our Author does not lose it's phlogiston upon boiling a considerable time, or upon lying open many days. If these do not shew you many irreconcilable differences between this artificial and the true native sulphureous waters, all other attempts must be vane.

Hence, see how your worthy *Coadjutor* helps a *Limper* over a stile; see how he has so *luckily* hit upon the discovery *he thought me so near*, which at once not only *emulates the impregnation*, and *qualities*, but even brings his impregnation to the *very standard* of *Aken* waters! See how much the physical world are obliged by this ingenious Author's *invaluable discovery*, his *new phenomenon* in Chemistry! admire the *new window*, which he has opened to let in *new light* upon these hitherto obscure matters, p. 19. Was there ever such a shameful collection of ridiculous puerilities offered to the public? Never sure before you and your worthy *predecessors* and *Junto* commenced writers in physic and chemistry. But to pursue the disagreeable subject a little farther.

There is no point of doctrine, which our author more strenuously labors to establish than the strong affinity between the acid of salt, and sulphur. This may be seen throughout his nameless pamphlet, but particularly from p. 13 to 19. But unfortunately, he happens to be in no point more mistaken: For, of all the acids, none will be found so remote from the asserted property, than that of sea salt.

It is not unknown to Chemists, that all the known acids in the universal creation are but so many different, accidental modifications of the original, the
primogenial

primogenial acid, to which the vitriolic or sulphureous acid bears the greatest affinity. By a certain method of union of the inflammable principle, in nature generally, by the means of putrification, with the primogenial acid, in a most subtilised state, the nitrous acid is produced; as that of salt is, by the intromission of the mercurial principle. Nor is the method of tracing these through the vegetable or animal creation, or proving this by induction, the transmuting or converting the one acid into the other, unknown; no more than, that the proper matrix of each acid, in the earth, is capable of repeatedly working this kind of generation.

But neither the theory of these processes, nor any experiment upon, or inference from them, can tend in any kind or degree, that I can conceive, to make out our author's asserted affinity of the acid of salt to sulphur. To illustrate, as far as we may, by experiments:

E X P E R. XI.

If the vitriolic acid, concentrated or well dephlegmated, be gradually dropped into any expressed or distilled vegetable oil, it mixes, not without commotion and heat, thickens it to the consistency of a natural balsam, bearing great analogy to the balsams produced by sulphur united with such oils.

E X P E R. XII.

If the acid of Nitre, well dephlegmated, be gradually dropped into such oils, after great heat and commotion, a thick balsam, or an hard artificial resin is produced. But if the affusion of the acid be more sudden and copious, with the oils specifically heavier than water especially, or, upon the addition of the
acid

acid of vitriol, with any ; violent agitation, smoke and actual flame are produced.

E X P E R. XIII.

If the dephlegmated acid of vitriol be gradually dropped to a certain proportion, into rectified spirits of wine, the mixture of two cold, colorless liquors, grows first exceeding hot, and then brown ; and upon destillation, yields some spirit of wine ; then the subtil fluid, called æther ; volatil vitriolic acid, and at length, the vinous oil and actual sulphur are produced.

E X P E R. XIV.

If the nitrous acid be cautiously united with rectified spirit of wine, excessive heat and dangerous and hardly coercible rarefaction ensues, and æther is produced by separation, as well as destillation.

These E X P E R. XI, XII, XIII, XIV and XV, all planely evince the near affinity, the powerful attraction, probably from that affinity, between all these phlogistic bodies and the two acids of vitriol and nitre. I might add, that from most of the mixtures, especially with the oil of vitriol, actual brimstone may be produced. Thus, to use our Author's phrase, the *Tendency* of these two acids to sulphur most evidently appears. How that of the muriatic acid stands, for which he so strenuously contends, may be collected from the following ;

E X P E R. XV.

1. Let the best dephlegmated acid of salt be dropped into any vegetable oil ; it may be mixed by agitation ; but will immediately separate, upon standing, without working or suffering any change.

2. Let

2. Let this acid be dropped into rectified spirit of wine; it mixes, but makes none other change in it. Destil them, they suffer no dulcification, as the other acids occasion, no change, but mixture, as at first.

It is not then unreasonable to conclude, that, far from our author's *tendency* to sulphur, this acid has not the least affinity to, or attraction with phlogistic bodies. Whence it may, with equal justice be pronounced the most *remote acid*, in the scale of affinity, from, the most opposite to *sulphur*, and the most *averse* to such a connexion, as produces sulphur.

Thus appears our Author's philosophy founded ! This is the result of the reasoning of a man, who recommends no less than a NEWTON's method of arguing in natural Philosophy, from Analysis to Induction ! Thus men will talk of *Robin Hood*, who never shot in his bow !

Our Author and you cannot now take it ill, that I think him most clearly acquitted of all imputation of knowing any thing of *Soda* or kelp, as a naturalist, a philosopher, or Chemist ; and that he is as ignorant of the various means and reasons of generating sulphur, as he is totally unacquainted with the difference between an alkaline solution of sulphur, and neuter or mineral alkaline Salts impregnated with the phlogiston, with or without the other constituent part of sulphur, in the most subtilised state. By this time, I hope, you and he are convinced, that there is nothing in your pamphlet or our Author's, that can invalidate that position of mine, which you level at, that *all known artificial solutions of sulphur* and waters upon this plan impregnated, must be more or less colored ; a position, which in no sort interferes with another confessed equally true, to wit, *that water may be, and is, by nature,*

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and

and by Art, impregnated with one, and sometimes with some degree of the other principle of sulphur, without suffering any change of color. And this is all that our author's pamphlet proves, a fact never doubted before. Do you not now see how this his HERCULES's club has dwindled into a despicable distaff! But you have this satisfaction from it, that if it do not serve, as was intended, to knock me down, you may, from it, spin thread for a notable web! At all events, however, you are one way or other to be some gainer by the contests between your friend the author and me. Nor is it the first time that our Collision, like that of flint and steel, has given you some sparks of light. Go to and enjoy it; *Quis opposito vetat Lumen de Lumine tolli!*

Let us now procede to give some demonstrative proofs how this artificial sulphureous water, or the sulphur may be generated in the kelp, and shew how it may be best extracted thence.

So powerful is the attraction between the Phlogiston and all salts and saline bodies, that few or none can be found perfectly void of this principle; though but few contain it in such quantity as to be demonstrated in it, experimentally; while most salts, fixed, alkaline and neuter, nitre always excepted, are capable of being charged with the Phlogiston in such quantity, as to admit of such a demonstration.

Hence, we see nothing more difficult to obtain than a fixed alkali, so perfectly pure, as to give a quite colorless solution. Thus, the salts procured by Tackenius's method, close calcination, are always highly colored and give highly colored solutions; and require repeated open calcinations to get free from this coloring matter, which appears to be the Phlogiston. To clear up this by Experiment.

E X P.

E X P E R. XVI.

I took white, dry Pot-ashes, which is a rudely prepared fixed alcali, obtained from wood and other vegetable ashes; dissolved half an ounce in half a pint of cold water, by agitation, and found the filtrated solution was slightly colored, to what the Ladies call, a pale straw color.

1. It wrought no change on a silver spoon with which it was stirred.

2. It suffered an ebullition with the vitriolic acid; but no visible precipitation or milkiness.

E X P E R. XVII.

I took some of the same pot-ashes, gave it a fusing heat, poured it into a clean bell metal mortar; when cool, it appeared to have acquired a blew cast, and a more acrid taste.

1. I dissolved half an ounce of it in half a pint of soft water by agitation, and filtrated it.

2. This got some smell like burning clay, different from the former, and somewhat of an higher degree of color.

3. But did not alter the silver spoon, with which it was stirred, in dissolving.

4. With the vitriolic acid, it suffered a smart ebullition, gave very little smell, seemed to contract the slightest degree of milkiness, which vanished upon standing, without any thing visible subsiding.

N. B. The salt in fusion, probably might have got some few particles of coal in the open crucible.

E X P E R. XVIII.

I took an ounce of the Pot-ashes, about half a drachm of charcoal, powdered, mixed and fused

them together. This yielded a blewish mass, to smell somewhat sulphureous, to taste acrid, bitter and sulphureous.

1. I dissolved half an ounce of it, powdered, in half a pint of cold water, by stirring, and filtrated the mixture which was blackish.

2. It immediately turned the silver spoon it was stirred with, yellow.

3. The filtrated liquor, which was not higher colored than that of Exper. xviii. smelled somewhat like this, to taste was acrid, bitter and sulphureous.

4. With the vitriolic acid, it suffered a smart ebullition, gave a stronger smell, and more sulphureous; grew milky, which, with it's color, subsided in light, pale clouds, upon standing.

E X P E R. XIX.

I took of the Pot-ashes one ounce, sea salt, half an ounce, charcoal, about half a drachm, powdered, mixed, and fused them. This was attended with bubbling, scintillation, and phosphorus-like corruscations. When these ceased, I poured it out into a clean warmed bell-metal mortar. It cooled into a blackish mass of a taste like newly made kelp; salt, lixivial, bitter and sulphureous, and like that grew moist in the air. When powdered, it was of an ash or lead color, or like newly made kelp, powdered.

1. I dissolved half an ounce of the powdered mass, by agitation, in half a pint of cold water. It was black and muddy. I filtrated it.

2. The filtrated solution was clear and had not half the color of those of Exp. xvii. xviii. xix. but smelled slightly sulphureous, tasted more so, with the acrid salt and bitter.

3. Tinged the silver spoon, as in Exp. xix.

4. With

4. With the vitriolic acid, it suffered an ebullition, inferior rather to that of this Exp. but gave a strong sulphureous smell; got an opac milkiness, and upon standing, let an inconsiderable, pale magistery subside.

It being remarkable of this Exper. that the solution was less colored than any of the rest of this class, I resolved to see whether or not this difference might be occasioned by the sea salt, I therefore proceeded to the trial.

E X P E R. XX.

I took sea salt, dry, one ounce, charcoal, about half a drachm, powdered mixed and fluxed them together. The mixture fused with bubblings, sentillations and phosphorous-like corruscations.

When these subsided, and the whole fused smoothly, I poured it out as the rest. It cooled into a mass of a dark liver color, on the outside, of an ash, or kelp color, within. It tasted salt, bitter and sulphureous, like ill calcined kelp.

1. I powdered half an ounce of this mass, and by agitation, dissolved it in half a pint of cold water, which it blackened. I filtrated it.

2. The solution, what was quite colorless and limpid; and smelled and tasted, as well as looked like a solution of kelp, but that it smelled rather stronger, and was not sensibly alkaline or urinous to the taste.

3. If instantly tinged the silver spoon with which it was stirred, of a deep yellow.

4. With the vitriolic acid, it suffered little or none ebullition; gave a strong sulphureous smell; acquired a slight milkiness, which diminished upon standing, without giving any kind or visible degree of precipitation.

5. In a few days, standing in an open decanter, it lost all sulphureous or phlogistic smell, taste and effects.

Let

Let us now make some observations and reasonings on these Experiments ;

The xvith shews the appearance and effects of the common coarse alcali, called Pot-ashes ; which however is hardly ever to be found free from some neuter salt, of the nature of tartar vitriolate.

The xviith shews the alteration, this suffers by further calcination, without the sensible addition of any phlogiston ; but with what it naturally contained, or accidentally received in open fusion, and the acquired neuter salt from the universal acid in the air ; it gives some, though slight, intimations of sulphur, N^o. 4.

The xviiiith shows how this salt imbibes the Phlogiston, onely by fusing with charcoal. Therefore it gives further indications of sulphur, as in N^o. 2, 3, 4 ; wanting onely to have met more of the concentrated universal acid, in fusion, which would have given sulphur more clearly and copiously, as succeeding experiments demonstrate.

The xixth gives a composition, bearing some analogy to kelp. The fixed alcali and the neuter, the muriatic salt, each imbibing certain quantities of the phlogiston from the coal ; and hence gave still clearer indications of a sulphureous impregnation, N^o. 2, 3, 4 ; while the solution was less colored than the preceding, owing to the salt, as will be more fully explained by the succeeding experiments.

The xxth as well as the former, shews the change, sea salt undergoes in calcination and fusion, with coally matter : If these operations are continued, the acid of the salt, which has some resemblance to the animal acid, which, united with the phlogiston, gives phosphorus, flying off with some of the phlogiston, gives a phosphorus-like flame or corruscation. If enough of the charcoal be added, and the fusion protracted, the salt will be divested of it's acid, and consequently alcalised. But, this not
being

being quite necessary to the present purpose ; it is enough to see, that this salt imbibes enough of the inflammable principle from the coally matter to give such strong indications of a sulphureous impregnation, N^o. 2 and 3, as would make our author and you call this, had you known it, one of your great *desiderata* in chemistry, an *artificial sulphureous water*, which is not alkaline, emulating the appearances and properties of the natural. But, N^o. 4. shews your mistake ; as it proves this a solution strongly charged with the phlogiston, as putrid sea and other salt waters are ; but wanting the great requisite from the universal acid, so that this, like putrid salt waters, may be called a *phlogistic*, but not a *sulphureous water*.

Now, as the xxth gave a less colored solution, though not less phlogistic than the preceding, and the xxist, a solution not less phlogistic than the xxth, though quite colorless, * it is easy to conceive it must be owing to the sea salt ; whence we see, that this salt has not the extreme *tendency* to sulphur, for which our author contends. And thus you may see, how far the observations cited from HOFFMAN, suit your friend's purposes.

A diligent enquirer may hit on intermediate experiments upon those plans to give the clearest demonstrations of the truths desired ; particularly that salt destroys, rather than tends to heighten the color of these solutions. But these are enough to shew, that salts are capable of imbibing the phlogiston, so as to impregnate water copiously with it. While it must be grossly absurd to call such a water sulphureous, as
it

* I must here observe, that in repeating these experiments, I discovered that some of the alkaline solutions were colored, which should have been colorless, and gave a resinous smell which arose from the filtering paper, which is not easily found free enough from pitch, to let an alkaline ley pass through it untainted.

it contains but one ingredient, and that the most simple, and that which makes but one sixteenth part of the mixt, called sulphur. You never call a water sulphureous for being charged with the other and the greater and more material part of the composition, the vitriolic acid : *Cinnabar* consists of *Mercury* and *sulphur*, about seven to one : Will you call every thing *Cinnabar*, in which you find *quicksilver*, or *sulphur* ? Yet could this be more absurd, than calling waters impregnated with the phlogiston, sulphureous, while the other material ingredient is wanting ?

If the ordinary means of generating sulphur were but thoroughly known to our author and you, there would be less difficulty of convincing you of these truths.

If any neuter salt, composed of a fixed salt or absorbent earth, and the vitriotic acid, be charged but with the phlogiston, by fusion, to facilitate which, and expedite the union, a redundance of fixed salt is in some measure necessary, as in the vitriolate tartar ; a mass, of a liver color, more or less dark, according as it is impregnated with the phlogiston, will be obtained. This gives a colored solution of sulphur, like that of *hepar sulphuris*, in water, which may be precipitated by acids into a pure magistery or precipitate of sulphur. And there is no good chemist insensible, that this sulphur is generated by the union of it's well known constituent parts, the phlogiston in the coal, and the vitriolic acid in the neuter salt. And no instance has as yet been found of sulphur's being produced from other principles, in nature or by her hand-maid, Art.

To apply this to our present purpose ;

E X P E R.

E X P E R. XXI.

I took sea salt one ounce, Glauber's salt two drachms, charcoal half a drachm; powdered mixed and fused them. The result was a dark colored mass, which powdered, was of an ash-color; it had a salt, somewhat acrid, bitter, and sulphureous taste.

1. I dissolved half an ounce of it, by mixing it with half a pint of cold water.

2. It tinged the silver spoon, with which it was stirred, yellow.

3. The solution filtrated was of a pale yellow; smelled and tasted like a slight solution of hepar sulphuris, but was less acrid.

4. With the vitriolic acid, it mixed without visible commotion, but gave a strong fetid smell, and grew darkly milky upon every drop, and let a fair precipitate soon subside.

You see, this differs from the preceding Exper. xx. only by the intromission of the vitriolic acid, by means of the Glauber's salt, the impregnation then, of that, was but *phlogistic*; but this is evidently *sulphureous*; for reasons, I hope, by now, made obvious.

But, if any doubt can still remane, repete the following.

E X P E R. XXII.

I took common sope-boiler's kelp, or soda one ounce, Glauber's salt, two drachms powdered, mixed and fused them. This gave a mass like the former, whose solution made like that.

1. Was colored, smelled and tasted alike.

2. Tinged silver alike.

F

3. And

3. And with the vitriolic acid, produced similar effects.

But, as, in this fusion, much of the phlogiston of the kelp is wasted, if half a drachm of charcoal be added, more sulphureous effects will be found in the mass, and from it's solution.

These, I should hope, would put the generation of sulphur and it's origin, out of all doubt, with our Author and you, and should clear up the difference between a water impregnated with the phlogiston alone, and one charged with this and the vitriolic acid ; the union of which alone can constitute a truly sulphureous water.

By this time, I flatter my self, our Author and you have a clearer notion of the nature of waters, charged with the soluble parts of Soda : They must be generally phlogistic, but never can be truly sulphureous, but when the kelp has by some means or other absorbed more or less of the vitriolic acid. And the share, the sea salt bears in the sulphureous impregnation, must appear to be most inconsiderable, if any at all. See Exp. x. to xv. and xix, xxi.

Upon the whole, as fixed alcalies are rarely, if ever, found quite free from phlogiston, and can never be long exposed to the air, more than the salt ley or bittern, without being in some measure neutralized or charged with the universal acid ; it is not difficult to conceive, why pot-ashes and kelp contain more or less of the constituent parts of sulphur.

Let us now examine the solutions of Kelp, and see what clame our Author has to the boasted invention, and to the introducing this medicine into practice.

Having already, though but rudely, sketched out the component parts of our subject ; no artist can be at a loss to know how to separate from the mass, the part or parts, he thinks fit for his purpose.

The

The saline parts are the most readily, by elixivation, separated from the mass. And with these, a considerable portion of the phlogiston must be washed off. To obtain these then, nothing further is necessary than to pour on the powdered kelp, the quantity of boiling water intended to be impregnated. But, in order to ascertain the proportions of the soluble, or easily soluble, to those of the insoluble, or hardly soluble parts, I took an ounce and half of pure solid kelp, powdered it well, and divided it into three equal parts, to prepare for the three experiments following:

E X P E R. XXIII.

I took half an ounce of the above solid kelp, powdered; mixed it in a glazed earthen vessel, with a pint of soft water; set it on a moderate fire, and continued it there, till it boiled thoroughly. I then removed it from the fire; and, as soon as it's heat became tolerable to glasses, filtrated it by a glass funnel into a glass decanter, pouring and washing the residuum into the paper coffin in the funnel.

1. The filtrated solution was colorless; while hot, smelled strong and offensive, not unlike a slight solution of liver of sulphur. It was of a salt, acrid, bitter and sulphureous taste.

2. It tarnished silver, from yellow to black, upon standing.

3. With the vitriolic acid, after a slight ebullition, it changed to a considerable milkiness; which, upon standing, became more opac, and let a light, white sediment subside.

4. What remaned in the filtrating paper, well dried, and carefully collected, weighed one drachm and an half. More salts may, no doubt, be extracted from this, with new water, by such as choose to carry the experiment further. But this, and the following experiments may serve to give a pretty just idea

of the proportion, the salts bear to the earths in the kelp.

But, in order to judge if further coction were necessary,

E X P E R. XXIV.

I took half an ounce of the same powdered mass of kelp with the preceding Exp^r. XXIII. mixed it with a pint and a quarter of the same water, in the same vessel, cleaned; placed it on the same fire and boiled it for fifteen minutes, when I found it had evaporated to the pint gauge, marked on the vessel. As soon as the glasses might bear the heat, I filtrated the liquor, pouring and washing the whole undissolved residuum into the coffin.

1. The filtrated solution was colorless, and smelled and tasted like the former, except that it seemed somewhat more acrid or lixivial on the palate.

2. It tarnished Silver, but more slowly and slightly, than the former.

3. With the vitriolic acid, it exhibited the like changes and appearances with the former.

4. The undissolved parts remaning in the coffin, carefully dried and gathered, weighed one drachm and twenty six granes.

In order to judge what further Coction might extract, or what changes the protracted coction might produce,

E X P E R. XXV.

I took half an ounce of the same kelp powdered, mixed it with a pint and an half of the same water, and in the same vessel, and on the same fire, boiled it, in the like manner, to the same standard, a pint. As hot as the rest, in the like manner, I separated the

the dissolved, from the undissolved parts, by filtration, saving the later in the paper coffin.

In the boiling, this had the like appearances with XXIII, XXIV. but that the smell seemed to abate as the coction was protracted. As soon as the heat admitted of it, I filtrated this, like the preceding.

1. The filtrated liquor was colorless, as that of XXIV. It smelled alike, but less than either, as it seemed to exceed both in the acrid or lixivial taste.

2. It tarnished silver, but more slowly and slightly than XXIII. or XXIV.

3. With the vitriolic acid, the effects and appearances seemed similar to these.

4. The undissolved matter in the coffin carefully dried and gathered, like the preceding, weighed one drachm and twenty five granes.

It is to be observed, that the decoctions of the three several experiments kept about eight days in open decanters, lost much of their smell. But a tea-spoon being put into a glass of each, at the same instant, the first got a copper colored tarnish before either of the others were altered, and got the color of purpled steel, by the time the second, and after it, the third, got a pale copper color ; which became a pale purple also, but never so deep as the first. Moreover, the vapors of these solutions, in boiling, tinges silver yellow, in the like proportion ; but these effects all diminish upon protracting the boiling.

After what has lately passed between you and me, I must suppose these experiments, XXIII, XXIV, XXV. can hardly require any explanation. And the purport of them cannot be less obvious. But to prevent new misapprehensions, I must go a little further.

The physician, who prescribes a Solution of Kelp, will no doubt, duly weigh and determine what he looks for in such a solution : If he looks for the salts and the phlogiston, these he obtains by the simple
solution

olution of boiling water, Exper. XXIII. And in this, besides the volatile parts, he has out of four drachms of Kelp, two drachms and an half of salts, that is five eighths of the whole; there remaning undissolved one drachm and an half, which makes three eighths of the whole.

This must have been different kelp from what our author used, when he tells us, p. 6. about half of his remaned insoluble after a quarter of an hour's boiling.

But you will probably, with our author, contend, that even by experiments, XXIV, XXV. it appears that the impregnation of these is rendered stronger, by the protracted boiling. Suppose I should concede this to you; it will not better your cause in the end: That the ley of kelp becomes stronger by long decoction, than it can be by one boiling, is certainly true. But that you may not mistake the cause, know that it is simply this: Earths of the calcarious kinds, calcined with sea salt, are rendered soluble in the way of salt ley or bittern, by a portion of the muriatic acid. And all lime, mixed and boiled with fixed alcalies, is partly dissolved and yields a ley far more acrid and caustic than the simple alkali. Hence, our author's decoction of Soda, as well as that of Exper. XXIV, XXV. is indeed more strongly charged than the simple solution of Exper. XXIII. that is, with earths, some four or five granes to a pint. But, it must be observed, that while the protracted decoction gains four or five granes of earth, and is thereby rendered more acrid, it loses in proportion what our author and you aim at, a *sulphureous impregnation*, his favorite offspring of sea salt! as is seen by the diminished effects of XXIV. 2, XXV. 2, and the succeeding observations, on the tarnishing silver. This the judicious prescriber will attend to; and this will determine him, if he means to give a more saline and acrid ley, to protract the boiling of the Soda. But, if the salts
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of Soda alone, charged with the phlogiston, be the instruments of health, he wishes to use ; then, he will certainly direct that simple process, by which these are best attained, which I may presume to say, is N^o. xxiii.

Thus, Sir, you see, I have the misfortune of differing from our Author, even in the way of his trade, which we may now call from his own phrase, by the new and elegant appellation of a DRUG-MANUFACTURER. The title, I fear will be found just among some of our unworthy dealers in medicine, who instead of preparers, or venders of pure, natural drugs, are actually *Drug-makers*. An imputation so far from men of our Author's character, that I hope he will not stick so close to the greek idiom, but rather change the appellation.

That you may not imagine, I wish to overlook the white precipitate of these experiments, I must inform you, that I have attended to it with the utmost care. I never, indeed, got a piece of Soda, from which I could get any thing like the common precipitate of sulphur, which was probably owing to it's being too compact to admit the impregnation of the universal acid from the air. And therefore, all that I have been yet able to procure of this precipitate, was so little, and seemed so subtil, if not volatil, that I have not as yet been able to put it to any other test, than drying the paper through which the white liquor was filtrated, and when I could not, with mine eye, discover the subtil precipitate, upon running the paper over with a red hot poker, a vivid blewish flame suddenly shewed itself, and as quickly expired : Much such as is seen by holding a paper, on which phosphorus has been rubbed, before a fire. This precipitate however, may be called sulphur. But, if it be such, it is probably, generally incomplete, from the want of the universal acid See Exper. xxi, xxii.

Physic is perhaps the onely profession, in which the proficients have in no age disdained to receive instruction

tion or improvement from persons of inferior ranks or understandings. When we are willing to collect useful knowledge, even from the irrational parts of the creation, we cannot surely refuse to receive it from the rational, and lest of all from men of the different branches of our profession. From these, we might certainly expect it, if every man would keep to the cultivating his own vineyard, and impart the fair fruits of his study and labor to his neighbour. But, to this, our Author scorns to confine himself, and yet is for teaching the whole faculty.

Would it not have been friendly in you, or some body in his secrets, to have hinted to our Author, that a man should excel first in his own art, before he undertakes to instruct or improve, and much more before he presumes to censure the members of a superior branch? I once heard of a pretended alchemist, who attempted to pass for a real one, with a gentleman, who made chemistry his principal study. The imaginary adept either actually believed, or would have the gentleman believe, that he had discovered, and for a fit recompence, was ready to impart, the grand secret. The gentleman asked him, what he was bred to? The adept answered, a barber, and that he had not yet quitted his trade. Pray then, learned Doctor, inform me, what is the use of sope in shaving? Though sope had long been very familiar to the poor alchemical Barber's hand, he neither knew it's composition, nor could account for it's most simple and common effects. Go friend, sayed the gentleman, and till you are versed in the inferior parts of Chemistry, make no pretensions to the more sublime, unless you choose to pass for a knave or a fool.

For the improvement of arts, as well as the reformation of manners, men should certainly begin at home; and those who would teach or censure others,

others, should not themselves be found deficient, at home.

Yet our Author, who certainly does not now appear quite perfect at home, sets out with nothing less than *opening a new light to Physic and to Chemistry, discovering a new medicine, teaching it's uses and it's doses*; and to inforce the later, tells us, p. 21. *that he has known very powerful medicines rendered very ineffectual, if not pernicious, from an error in the prescriber, in not knowing how to dose them.* Thus our Author takes upon him, not onely to teach, but to censure, the practitioners in physic, of his time. How justly, and how becoming his function, let cool and judicious heads determine. As I am not of consequence enough to feel myself galled by the charge, I shall say nothing for my self. But I must think more justice, if not more respect and more deference, due to all the gentlemen of the faculty, who have practiced in this city in our Author's time.

But let us wave this, and observe his doses; to *adults fiveteen grains, twice a day, and to infants five or six*; more, he says, *irritating the bowels too much.* In this, by his calculation, there is but half, by mine, somewhat more than half, of soluble parts, the rest, for ought we yet see, inert earth. Can fiveteen, or six granes a day of the salts of kelp, produce such disagreeable, such forbidding effects? I affirm, that ordinarily and properly given, it is impossible, and as a farther proof, I also affirm, what I might appele to the files of many apothecaries for, that I have given Soda in powder, to adults, to the quantity of thirty granes, and to children, from six to ten or twelve or fiveteen granes, twice, sometimes, three times a day, for weeks, yea months, with good success, and no kind of sensible evil effects. And that I have likewise given it in larger proportion in solution, with like

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desire-

desireable and no evil effects, as I shall more fully explain in the sequel.

While I must suppose, I stand acquitted of having learned the uses or doses of Soda from our Author ; I must take care not to arrogate to my self any merit from a pretended discovery. Whoever considers the efficacy of the nitre of the antients, and attends to extensive courses of Chemistry, wherein all the products of nature and art fall under consideration, and wherein such a subject as Soda could hardly escape, must be acquainted with the nature of Kelp, and must judge it bears as near analogy to that nitre, as any like artificial production can to a natural.

This will be rendered more plane, by a short review of the sentiments of the antients, with respect to alcalies, but particularly to their nitre.

The artificial alcalies do not appear to have been so much in use among the antients, as the natural, which were better known and distinguished under the different appellations of natron, nitron, nitrum, lithron, lithrum, aphronitron, aphronitrum, halinitron, halinitrum, halmiraga, halmirax, spuma and flos nitri, &c. as those were by the names of alchali, alkali or alcali, Soda, Alumen catinum, &c.

By alkali, was first understood the salt obtained by calcination of the marine plant, whose *Arabic* name is Kali, by elixiviation of it's ashes, and evaporation of the ley. Sometimes the gross mass of ashes was indiscriminately taken under the name of alkali, for the salt, not onely by the *Arabians*, but some succeeding Greek and Roman writers.

The plant known to the *Arabians* by the name of Kali, or Chali, by the *Latins* was called Soda, and the mass obtained by it's calcination was known under the same appellation. But when the salt was separated from the mass, as above mentioned, it was then, and not till then, distinguished by the name of Sal Sodae.

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The Alumin Catinum seems to have been the gross mass of Soda or kelp.

These were the first known, and were produced from marine or submarine plants. But some, * pretty early mention salt obtained from burned wood, or wood ashes, preferring that of the oak, which might have been analogous to the modern pot or gravelled ashes. And PLINIUS † observes, that lees of wine, dried and calcined, acquire the nature and qualities of nitre.

I do not recollect, that these are by any of the antients distinguished with due precision and accuracy from each other; and they seem, as by common consent, to have been for all uses and purposes, indiscriminately taken for the native alkali or nitre of the antients, whose place they in time so far usurped, that however plentifully all Asia, particularly Ægypt, abounded with nitre, MATHIOLUS § complains, that in his days, none of that salt was brought into Italy.

It is true, indeed, the affinity of the nitre of the antients to Soda, if not the identity of both, appears by comparing what the old writers have recorded of the nature, properties and uses of their nitre, to those which the moderns have discovered in kelp.

The antients have not informed us of any essential-differences of kinds of their nitre. We can only collect, that they in general distinguished theirs by some accidental differences from the places and forms in which it was found, and thus particularly divided it into two kinds; the one native, as it was found in solid glebes in the earth, efflorescing on the surface of the earth or on walls, or oozing through vaults and caves; where it formed efflorescences, little

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pipes,

* TACITUS, Annal. Lib. xiii. PLINIUS, Histor. Natur. Lib. xxxi. Cap. 7. and AGRICOLA, de re Metallica and de Natura Fossilium.

† Lib. xiv. c. 20.

Comment in Dioscorid.

pipes, &c. and the fictitious, which was obtained by natural or artificial elutriation of nitrous earths, and the natural or artificial evaporation of the ley. The former, when equally pure, they always preferred to the later.

The aphronitrum or flowers, spume or froth of nitre was generally reckoned the best, for all their purposes, and it's choice consisted in it's being, brittle, light, spongy, porous or fistular, and white or of a kind of purple color; which, with it's salt, acrid and bitter taste, shews it's correspondence with our kelp. The oeconomical uses of the nitre of the antients seem, as far as they were versed in Chemistry, to correspond with the modern uses of kelp or pot-ashes; such as glass making, washing, cleansing and the like.

The medicinal uses of their nitre was more extensive; in so much, that whoever casts his eye over the most celebrated writers of antiquity on this subject, and at the same time rationally weighs the nature and properties of fixed alcalies, will find abundant reason to lament the general disuse into which these most powerful medicines have generally fallen in these later days.

By reason and experience, our observant fathers found and recorded the efficacy of these salts.

They, indeed, for want of more knowledge in Chemistry, confounded the mineral alcali in their nitre, with the muriatic salt which was always joined with it. Hence, DIOSCORIDES * ascribes similar virtues to nitre, aphronitre and salt; but reckons the second the more powerful. They were externally applied in emplasters and unguents for the purposes of resolving, discussing and drawing; mixed with honey, they were used in certain disorders of the eyes

* Lib. v. 68j.

eyes. They were applied, as lotions, to abscesses of the ears, to cleanse them, and to relieve them from beating and noise. In ointments with hog's-lard or asses suet, for the bites of mad dogs. In emplasters or pultises with figs, for oedemas and anasarças. Internally, dissolved in water, or mixed in it, with powdered cumin seed, or in a decoction of rue, dill, anis or the like carminatives, he recommends it to relieve flatulencies and pains of the intestines ; against the poison of mushrooms, and against the effects arising from the taking of bull's blood, with silphium ; as also against the venom, of certain insects of the cantharides kind; *Buprestis*.

GALEN * looks upon nitre as possessing an intermediate rank between aphronitre and salt. By calcination, he tells us, it is brought nearer the former, being thereby subtilised : By which, his reason for preferring that to nitre is seen. He reckons it of a drying and digestive quality, and an incisive, attenuant, and resolvent of gross and viscid humors.

PLINIUS †, an industrious collector of the writings and sentiments of the authors to his time, is more extensive on the medicinal uses of Nitre. He ascribes the same qualities and virtues to it with Dioscorides and Galen, and adds, that the nitre works are remarkable for conducing to the clearness of the eyes, which are there never seen bleared ; that ulcers brought thither are speedily healed, while those contracted there are tardily cured. He says, it mollifies the skin and promotes sweat, being rubbed on with oil. It is acrid and extenuant, drying, incrassative, heating and escharotic ; fit in all cases, where drawing, discussing, deterging and extenuating are proper, as in pimples and pustules :

* De simp. Medicament. Facult. Lib. viii. and xi.

† Hist. Natur. Lib. xxxi, Cap. 10. Lib. xxxv. Cap. 17.

For these purposes, some calcine and extinguish it in austere wine, or medicate their baths with it. Excessive sweats are restrained by it with the addition of dry orrice and green oil. In a gargle, with pepper and wine, or a decoction of leeks, it eases pains of the teeth. Calcined and used as a dentifrice, it cleanses and whitens the teeth. In an ointment with Samian earth and oil, it kills lice and other vermin that infest the skin. With equal parts of Cimolian earth, adding a sufficient quantity of vinegar, mixed and rubbed on pituitous swellings of the limbs, it wonderfully relieves them. It is useful in pituitous swellings and eruptions all over the body. In emplasters with resin, or a pultice with grapes, it opens and draws boils. It is effectual in the bites of mad dogs and other venomous animals, and in phagedenic, corroding and putrid ulcers. It is, externally, as well as internally, applied, and found useful in dropries. It refreshes wearied persons by rubbing the skin with it, mixed with oil and vinegar. Mixed with honey and cows milk, it clears the skin of pustules, and exulcerations. It is given in pains of the intestines and reins, rigors of the body and pains of the nerves. In a palsy of the tongue. In certain Asthmas, mixed with appropriate ptisans. In inveterate coughs, with equal parts of galbanum and turpentine. In the quinzy, with tar. It gives ease to pains of the joints, upon rubbing them in the sun with this and Cyprian oil mixed. It dispels flatulencies, and being drank in wine, cures the jaundice, and the itchings attendant on it, being taken with vinegar. With allum mixed, it cures the itch. It frees the skin from offensive smells, by frequent washings. It is given in indigestions and laxes. Anointing the skin with nitre and oil, before the return of the paroxysms of intermittents, is recommended by many ; as also in white scaly eruptions, in leprosy, freckles, and other cutaneous foulnesses. It is used with good effects, in
baths

baths, for the gout, as also in atrophic, episthotous and tetanous cases.

With these, AGRICOLA * in general agrees.

FALLOPIUS † is of the like sentiments; but justly ascribes a mild purgative quality to nitre. But however, recommends it, rather to be mixed with other purgatives, to correct and render them more effectual, than to be given as such, by itself. Moreover, he mentions it as an errhine, and looks upon it as effectual in promoting uterine evacuations and cleansings.

The same virtues are ascribed to the nitrous waters, but more explicitly, as these were more freely used. These are particularly declared to be effectual in resolving strumous affections, and in curing the itch, and other cutaneous eruptions. See STRABO, AGRICOLA *de natura fossil.* CAELIUS, AURELIANUS, FALLOPIUS *de Aquis Thermal.* BACCIUS *de Thermis*, &c.

Though I before § gave hints of these sentiments, I think it necessary to clear up the matter a little further here; as in your *argument*, you glance some obscurity on the matter, and because it will help to shew you, that there is nothing either new or clear in our author's medicinal notions of kelp.

I hope, I shall not be found to flatter my self, when I presume, you will now do me the justice you have heretofore denied me, and confess, that I have declared and demonstrated the *Aken* and *Borset* baths to be composed of salts, if not of earths, analogous to those of the nitre of the antients, together with the principles of sulphur in some. And that upon these demonstrated impregnations, I have layed down the uses and virtues of those waters.

From whence our author took his notions of soda, I shall not take upon me to say. I must, for myself,

* De Natur. Fossil. Lib. III. † De Simplic. Medicament.
§ ESSAY ON WATERS, P. III. *Aken* Bath.

confess,

confess, I took mine from finding kelp correspond with every thing the antients have thought fit to hand down to us, with clearness, relative to their nitre.

His notions of the productions of the mineral alcali is not quite agreeable to mine. On p. 15, 16. he explains it very familiarly and confidently, by *fossil salts being calcined by ignited pyrites in the bowels of the earth*. But, in a letter to me, soon after the publication, he sees his error, and attempts to correct it, by the interposition of some other fuel, perhaps large quantities of wood, &c. How either hypothesis could answer his purpose, I own I cannot see: For, if by the first, Glauber's salt must be produced, from the union of the vitriolic acid, in the pyrite, with the basis of the fossil salt, which our author himself judges by the second; will not his *large quantity of wood* calcined, give an alkali of an other kind, the fixed vegetable, as well as the mineral?

I am not ashamed to own mine ignorance of the manner in which the mineral alcali is produced in nature. But it would seem to me to be an easier and less strained conjecture to judge that the native alkali has been, in many places, if not universally, produced by some accidental calcination of sea weeds.

It can not be very difficult to conceive this, when we find a variety of the fullest grown shells and other like productions of the sea, upon some of the highest hills known, particularly about *Aken*. By whatsoever means these came to be left by the parent sea on dry land; it can not be difficult to conceive plenty of sea weeds deserted in the same place and manner. We may readily conceive an almost infinite variety of accidents by which these may be set on fire and burned. And it is not at all wonderful that the salt resulting from such a calcination should in tract of
time

time enter into the bowels of the earth, and afterwards shew itself in the different forms, in which it is discovered, in nitron, aphronitron or the like. But if this should not please our author or you, I think at present but of another subterfuge: Modern discoveries clearly shew, that not onely amber and other bitumens, were vegetable juices; but that the various kinds of fossil coal were once actual wood, which, by the inimitable and ineffable chemistry of nature, are mineralised into those forms. Why may not the vegetable alkali suffer a mineralisation, upon the same principles?

It can hardly be displeasing to our author to find these matters brought so near an accommodation to some of his sentiments, to wit, that *the natural sulphureous waters derive ALL their qualities from Sal Sodae*; though it is hoped he will not now insist upon this; since, if he be not content with the difference made out in the *ESSAY ON WATERS*, he must here see that *Aken Baths* and such like waters, are not, as he contends, mere solutions of soda or such like phlogistic salts.

How far the nitre of the antients might have been impregnated with phlogiston, they have left us too little to judge by, but conjecture. I own myself of opinion, that all that were colored, especially purple, blue or black, were thus impregnated, in different degrees. And I confess, that it was from the first hints the old sages gave of the nature and uses of their nitre, and a chemical examination of kelp, that I was first induced to judge of their affinities, and induced to prove the similarity of their powers in medicine.

These considerations early moved me to bring kelp to the test. And, I must confess, I never thought the like troubles better recompensed: For, after having long and often administered it, in a great variety of cases, I never met with any medicine that better

and more certainly answered mine expectations, than kelp.

I can now with confidence pronounce, that there is nothing sayed, with due precision and clearness, by the antients, with respect to their nitre or to waters merely nitrous, that is not found to hold true of kelp.

So thoroughly was I persuaded of the efficacy of this medicine in cleansing the skin of most eruptions, particularly those that are caused by insects, as the itch, &c. that when I proposed the building, by charitable contribution, a Water Hospital, or public Bagnio * in *London*, for which I could have got very many great subscriptions, could I have submitted to take the charge of public money; the principal ingredients I had in view, for making medicated waters, lotions, eye-waters and baths for the poor, was soda.

It cleanses the skin, without leaving the disagreeable dryness and crispness, which attend the like washes of the vegetable alkali, and the intolerable impression which sope leaves. And by repeted washings, takes off strong and offensive smells of sweat; cures a great variety of cutaneous eruptions and foulnesses, those attended with insects especially; relieves those itchings, inflammations, and other disorders of the eyes, that are occasioned by insects; than which, there is not a more common disease among the poor. It makes a most excellent fomentation for cold anasarcaous, oedematous and other indolent tumours. And the best injection for imposthumes, ulcers and foulnesses of the ears.

Nothing makes a more efficacious wash for the relief of obstinate eruptions on the head, particularly that, called the scald: The parts being kept closely clipped, are to be washed with a solution of soda,

* See the first hint on the *ESSAY* on Waters.

by a fit brush, twice a day ; while the same, or some other appropriate sweetening course is provided internally.

Frequent washings in such a solution destroys the insects with which the skins of men, as well as brutes, are infested. And as the itch and such like eruptions of the one, so the mange and such like cutaneous foulnesses of the other may be relieved by the same means ; so may both, by previous cleansings, by washings, be prevented.

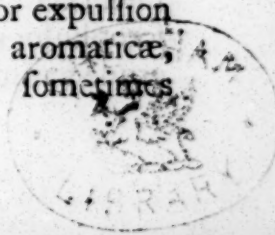
And though the smell of such a lotion or bath must be offensive, this comfort attends those who use either, that the smell vanishes almost as soon as the skin dries.

Internally taken, it obtunds acidity in the first passages and proves gently aperient ; if increased, purgative.

The salt of soda, separated from the sea salt, is much more mild in all it's operations, than the vegetable alcali ; and is not less efficacious, though much less offensive, than sope. It is powerfully, though mildly, resolvent, attenuant, diuretic, and deterfive. This salt may be given in many cases, where the concomitant sea salt may be improper.

The intire mass or it's solution are among the most powerful remedies, I know, in the general train of disorders arising from indigestions and crudities, particularly obstructions of the mesentery and the whole glandular system. And all that is tediously sought for these distempers, in spongia usta, æthiops, vegetabilis and sea water, center in soda.

The antients reckoned their nitre a specific against noxious mushrooms ; and I know nothing so effectual against surfeits of any mushrooms or other vegetables, or over-loading the bowels with animal food. Nothing promotes their digestion or expulsion better. In these cases, sometimes species aromatica,



sometimes some opening salt are to be occasionally added.

By soda alone, after all the common remedies have proved ineffectual, I have known children speedily freed from worms, from tumid bellies, obstructed glands, paleness, lassitude, &c. disorders which usually end in rickets or in death.

And, I could instance some cases of adults, where the whole glandular system, as far as could be discovered inwardly, as well as outwardly, has been so obstructed, as to bring on the most violent and dangerous symptoms; effectually relieved by a course of soda. And I can not say, I know an instance, in many cases of this nature in leucophlegmatic habits, which are the fit subjects for it, where a course of soda was fairly tried, without the desired success. And for the same reason, I have found it stimulate the desirable discharges in hydropic and attendant icteric cases, where the whole class of hydragogues and hepatic medicines have proved ineffectual. Likewise, in obstinate, inveterate coughs, in subjects with obstructed glands, I have found soda very serviceable, where there has been no hæmoptoes or ulcerations of the lungs.

Thus you may easily see, how extensive the use of this powerful remedy, in judicious hands, may be found.

In habits highly sanguine and bilious, this medicine may not be given with safety, but after proper preparation and with judicious attention and caution; for reasons which must be obvious to you.

In the cases of infants, as well as adults, where there is a redundancy of humidity; I generally give the pure soda in fine powder, simple, or with the addition of some medicine coinciding with the general intention: Thus, in some obstinate scurvies, and scrophulous cases, I add a third or a fourth part of crude antimony levigated, which it is capable of rendering

dering emetic ; for reasons known to all that are well versed in the chemical treatment of that mineral. And thus it becomes a still more powerful and active remedy in judicious hands.

In the bowel cases of infants, I give it, either simple, or occasionally joined with rubarb, scammony, &c. and, if it proves heating, I add a little of the crystals of Tartar. You know the result is *Seignette's* salt.

In the cold constitution, with obstructed glands, I give it in powders, pills, boles or electaries, simple, or joined with *Species Aromaticæ*, *Ammoniacum*, *Galbanum*, *Helenium*, *Rubia Tinctorum*, *Millepedes*, *Caro Viperina*, &c.

In the Dropsies and Jaundices of such, I give it pure, or joined in convenient forms with *Rheum*, *Jalapa*, *Scamonium*, *Gutta Gambæ*, and the like.

In their coughs and asthmas, either pure or joined in convenient forms with *Crocus*, *Myrrba*, *Ammoniacum*, *Galbanum*, *Camphora*, *Helenium*, *Millepedes*, &c.

One may correct or disguise the smell, with any aromatic. But, it rarely, if ever, requires such correctors, except where copious dilution may not be admitted, which best corrects or prevents any irritation it can otherwise give the bowels.

And thus, I frequently have given it, from six or ten to fiveteen, twenty, or thirty granes, three times a day. I have given it from two scruples, to a drachm once a day, to several, without finding any sensible ill effect. In an advanced dose, it generally makes it's way through the first passages onely ; in smaller doses, it goes further, and manifests itself by the pores and the kidneys. And it rarely, if ever, requires any thing to correct or mitigate it's operation, except simple dilution.

In solution, I make more free with it : I direct it to be dissolved pure, from two to four drachms, in a quart of water, and sometimes occasionally add some
drops

drops of the acids of salt, nitre, or vitriol. Sometimes a drachm or two of *spiritus nitri vel vitrioli dulcis*, an ounce, two or three of *aqua junip. comp.* a drachm or two of chrystals of tartar, or of *Epsom* or *Glauber's* salts. And thus, I give from a pint to a quart, in different potions, at the proper, medicinal intervals, to adults, in the twenty four hours, and from six to twelve ounces to children, from six to sixteen or eighteen years of age.

In this form, simple, it generally speaking, proves gently opening and diuretic, and powerfully sweetening, if long continued; but it is in the judicious practitioners power to alter it extremely by the simplest additions. Thus, the acid of salt added, brings it more to the nature of sea salt, which is generated as this acid saturates the mineral alkali. The acid of nitre, saturating this alkali, makes it of a more cooling nature, and more diuretic, as it generates quadrangular nitre, which has much of the property of the prismatic or modern nitre or saltpetre. And the vitriolic acid saturating the *sal sodae*, you know, gives *sal Glauberi*. So also the acid or crystals of tartar produce *Seignette's* salt. Those, who do not choose to trust to these like saturations, which, you know must affect the sulphureous impregnation, may add any of those or the other opening neuter salts; by which you see what power the rational prescriber has over this medicine, by increasing, limiting or changing it's operations, upon a small simple addition.

In this form, I look upon such a simple solution of soda to be superior to any of the waters which you and others deem sulphureous, in these kingdoms. Yea, superior to any of the known simply nitrous waters. But the accurate prescriber will ever cautiously distinguish such artificial solutions or impregnations, from the natural and truly sulphureous waters, such as those of *Aken*, and even some others of inferior note; which are so far from being alkaline, in the natural state;

state; that they appear neutrated by a subtil native spirit, perhaps not to be imitated by art.

You will sometimes meet with stomachs so cold and so flatulent as to require the addition of some of the aromatic spirits mentioned. And these bring it to bear greater analogy to the spirituous mineral waters, that are impregnated with the like salts and the phlogiston.

The above mentioned solution will in general be found strong enough for baths, lotions, injections for the ears, and eye-waters. But for the former purposes, as well as for fomentations, the impregnation may be made occasionally stronger, as far as the proportion of an ounce or an ounce and an half, or two ounces to a quart. And I know nothing so likely to prevent or to cure the many cutaneous foulnesses, in the way of insects or eruptions, to which the poor of this and the northern confines of the next kingdom are so miserably subject, as the frequent use of such baths, which may be occasionally used, either tepid or cold, at an inconsiderable expence. Wherefore, I hope to see soda, if it be for this purpose onely, speedily taken into the oeconomy of our hospitals.

Soda also affords a most powerful vapor bath: For, as it bears long boiling before it is quite divested of it's phlogiston, so the vapor of boiling water, with this impregnated, may be conveyed into fit receptacles for the limbs or other parts of the body, and may be found serviceable in many obstinate cases as a discutient and resolvent, as well as in cutaneous eruptions and the haemorrhoids. But the judicious practitioner will ever carefully distinguish betwixt such a vapor and that of the native sulphureous waters, which is, as far as I have been able to collect, ever charged with a volatil, subtil acid.

I could enumerate many other most salutary purposes, to which I have often applied soda. But these, I flatter myself, will be enough to lead the rational practitioner

practitioner to further disquisitions into so interesting a subject; while these crude hints alone may shew him, that it is not owing to our author, that this medicine has been introduced into practice. And for my part, I onely pretend to have helped to revive it's use. Nor am I even in this singular; since I have sometimes seen it prescribed in consultations of eminent practitioners.

One of the principal cautions to be inculcated in the internal use of this mild alkali, which requires closer attention in the more acrid, is to be taken from the general solvent powers of these salts. No animal glew can withstand their power. Even silk, wool, &c. are speedily dissolved by fixed alkalies. Hence such salts should be cautiously given where there is any reason to fear the abrasion of the mucus of the intestines, or other vessels.

One, and that a topical, use of Soda, which I had forgot in the more proper place, is as a dentifrice. There are no disorders more rife, at the same time none more neglected, among us, than those which beginning with tumors, funguses and exulcerations of the gums, end in the loss, or which is worse, in rottenness of the teeth, and sometimes of the jaw bones.

To prevent, as well as to remedy those evils, I know nothing so effectual as the rubbing the gums and teeth with Soda in fine powder, by a proper brush. For those who find it too sharp, it may be softened, by the addition of a proper quantity of bole, and as much liquified honey, as will make it into a paste. For those whose gums are loaded with cold rheum, it may be warmed by the addition of myrrh, mastich, species aromaticæ, canella alba or the like.

Thus,

Thus, Sir, you may see, I have judged the subject of our Author's pamphlet well worthy of serious consideration, though not for the purposes, for which he and you have taken it up. See how his observation is verified, when he tells us, p. 8. that I was *near discovering his secret sulphureous water*, when I found a salt corresponding with Soda in the baths of *Aken*? Might he not with equal propriety and justice have reversed this position, and said, that a person who had found a salt in sulphureous waters, which bears so great analogy to kelp, that he compares the one to the other, could not be far from being acquainted with the nature and qualities of Soda? Could the comparison be made, so as to hold good, without a perfect acquaintance with both? Then, what pretensions can our Author have to any priority, in any part of his self-assumed discovery? Let him recollect what passed between him and me on his mentioning his imaginary secret, and he must confess, I was ready to tell him various means of making such a solution, had he not pretended to the sole discovery. And by the P. S. of my first letter to you, which was prior to our Author's last pamphlet, and by this, you may judge, I was not altogether a stranger to the qualities of kelp and it's solutions.

I hope by this time, you and he are satisfied that though *Aken* water contains the mineral alcali and sea salt, the sulphureous impregnation is of a different kind from any, he or you have conceived. The salts of the baths of *Aken* and those of *Borset* are one and the same: Yet one is highly charged with the constituent parts of sulphur, and the other perfectly devoid of such an impregnation. If this depended upon the fixed salts, must not *Borset* be found as sulphureous as *Aken* baths? And is it not the reverse? Whence this? I flatter myself, this is made pretty clear in the Essay on Waters.

I

If

If then, the waters of *Aken*, and even your sulphureous waters, appear to be impregnated with some of the same ingredients in common, and some of them with other ingredients of a quite contrary nature to the solutions of kelp, or to any known alkaline solutions of sulphur; with what face can any man, of the slightest pretensions to knowledge in physic or chemistry, confound all together, and declare that the last answers all the characters and virtues of the former, and even that these deserve the preference to those?

I hope, I have heretofore layed open the nature of the onely sulphureous waters, I have yet met withal. And I hope, I have so far explained the nature of Soda and it's solutions, as to obviate the like destructive confusions for the future.

I am not without fears, that the judicious will think this performance as crude and premature, as I have judged our Author's: For this, you will accept mine apology: Our Author's pamphlet came into mine hands soon after my first letter to you was published, when I was deprived of the use of my limbs in the gout. The reading and animadverting upon this singular performance made up my chief amusement, when I was unfit for all business besides. When I was able to sit up, I directed the experiments to be made before me. I thought such animadversions would lose of their weight by delay, and I could not hope, were I capable of business, to have leisure to give them any attention.

Add to this, that as I came here more with a view to discharge the duties of the station to which I am called, with respect to the public, than those of my profession for mine own private emolument, I have not yet brought over my books, papers, or chemical Apparatus; so that I sit down to a work of this kind, under the greatest disadvantages, void of all the necessary helps to such an undertaking.

Wherefore

Wherefore, I hope, the judicious, who must be above taking any thing in the Chemistry or Physics upon trust, will make all reasonable and humane indulgences for such errors and omissions as must almost necessarily attend a work of this kind, undertaken in such circumstances and under so many difficulties and disadvantages.

I am not arrogant enough to take upon me to instruct the gentlemen of the profession. But thus much, I judge, self-justification, and the vindicating a most useful medicine, and the rescuing it from empiricism demanded. If it answers these purposes, and gains any degree of the approbation of the judicious, it will more than recompensate the labor of,

S I R,

Your Friend and Servant,

DUBLIN, March

30. 1763.

C. L U C A S.

F I N I S.

E R R A T A.

- P**Age 2. Line 34. for Phænomea, read Phænomenia;
 4. l. 18. after to, add some of
 5. l. 7. for Chrystals, r. Crystals
 13. l. 31. for on, r. in
 17. l. 33. after proof, add of
 18. l. 21. after form, add.
 20. l. 17. after be, add merely
 24. l. 18. Dele and xv
 28. l. 33. for xvii, xviii, xix, r. xvi, xvii, xviii.
 l. 36. for xix, r. xviii
 29. l. 14. for sentillations, r. scintillations
 l. 25. Dele what
 l. 29. for If, r. It
 31. l. 17. for xxth, r. xixth
 l. 19. for xxist, r. xx
 l. 20. for xxth, r. xixth
 49. l. 12. for vegitable, r. vegetable
 l. 25. for plogiston, r. phlogiston
 52. l. 24. for has, r. have